

Notice of Allowability

Application No.

10/065,037

Examiner

Tiffany A Fetzner

Applicant(s)

HAVENS ET AL.

Art Unit

2859

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 07/06/2004 & the telephonic interview of July 7th 2004.
2. ☒ The allowed claim(s) is/are 1-20.
3. ☐ The drawings filed on _____ are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 07/10/2004.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____. |

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with Associate **Attorney Jeffery J. Chapp, Reg. No. 50,579** on **July 6th 2004** along with authorization to charge any necessary fees to applicant's deposit account.
3. The application has been amended as follows:

A) Replace claim 1 with the following Examiner amended claim 1:

Claim 1 --- A Magnetic Resonance Imaging (MRI) magnet field instability simulator comprising:

a rigid body motion generator **simulating motions** of one or more MRI system components;

an eddy current analyzer generating a magnetic stiffness and damping signal and an electromagnetic transfer function in response to said **simulated** motions and a cryostat material properties signal;

a mechanical model generator generating a mechanical disturbance signal and a mechanical model of one or more MRI system components in response to said **simulated** motions and said magnetic stiffness and damping signal;

a structural analyzer generating a **simulated** motion signal in response to said mechanical model; and

a field instability calculator generating a field instability signal in response to said electromagnetic transfer function and said simulated motion signal. ---

B) Replace claim 4 with the following Examiner amended claim 4:

Claim 4 --- A simulator as in **claim 1** wherein said **simulated** motion signal comprises information corresponding to at least one of cryostat motion, coil motion, magnet motion, and environmental motion.---

C) Replace claim 9 with the following Examiner amended claim 9:

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Claim 9 --- A method of simulating and determining field instability within an MRI system comprising:

- simulating motions of one or more MRI system components;
- generating a magnetic stiffness and damping signal and an electromagnetic transfer function in response to said **simulated** motions and a cryostat material properties signal;
- generating a mechanical disturbance signal and a mechanical model of one or more MRI system components in response to said **simulated** motions and said magnetic stiffness and damping signal;
- generating a **simulated** motion signal in response to said mechanical model; and
- generating a field instability signal in response to said electromagnetic transfer function and said **simulated** motion signal. ---

D) Replace claim 11 with the following Examiner amended claim 11:

Claim 11 --- A simulator as in **claim 9** wherein generating a **simulated** motion signal comprises performing a structural analysis of one or more MRI system components. ---

E) Replace claim 19 with the following Examiner amended claim 19:

Claim 19 --- A method of simulating and determining field instability within an MRI system comprising:

- simulating motions of one or more MRI system components;
- generating a magnetic stiffness and damping signal and an electromagnetic transfer function in response to said **simulated** motions and a cryostat material properties signal;
- generating a mechanical disturbance signal and a mechanical model of one or more MRI system components in response to said **simulated** motions and said magnetic stiffness and damping signal;
- generating a **simulated** motion signal in response to said mechanical model; and
- generating a field instability signal in response to said electromagnetic transfer function and said **simulated** motion signal;
- frequency sweeping said field instability signal to obtain a desired frequency operating range;
- modifying at least one MRI system feature to adjust said field instability signal wherein a resulting frequency operating band is **adjusted** to be **within** said desired frequency operating range. ---

Examiner's Comment

Drawings

4. A New set of corrected drawings are required in this application because the corrections to figure 1 (i.e. the labeling of **super conducting magnetic field coils 16**, taught on page 5 paragraph [0022]; and the labeling of the **second exterior side 54** and the **cylindrical dielectric former 56**, taught on page 6 paragraph [0026] which were not shown in the originally filed figures, were never received by the USPTO.
5. The January 9th 2004 amendment contained no corrected drawing submission.
6. A **complete set of NEW FORMAL DRAWINGS** including the corrections listed above, which are approved by the examiner are now required.
7. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings.
8. The corrected Formal drawings, including a new Formal drawing of Figure 1, are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

The following is an examiner's statement of **Reasons for Allowance**:

9. With respect to examiner amended **claims 1, 9, 19, 4, 11, and dependent claims 2, 3, 5-8, 10, 12-18, 20** These claims are allowable over the prior art of record because the prior art of record does not disclose or suggest an MRI apparatus/method comprising "simulating motions of one or more MRI components", and then using the "simulated motion" signals to determine the field instability within an MRI system," **in combination with each of the remaining limitations of each of the claims**. It is the combination of the claim limitations taken as a whole that constitutes both the novelty and non-obviousness of applicant's claims. The prior art MRI simulators, simulate the pulse sequences, as opposed to the actual MRI components as set forth and claimed by applicant.
10. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Prior Art made of Record

11. The **prior art made of record** and not relied upon is considered pertinent to applicant's disclosure.

A) Zur US patent 6,191,582 B1 issued February 12th 2001, filed July 21st 1999 which teaches a method for eddy current compensation, simulation, modeling, and improved stabilization in an NMR / MRI system. See the entire reference.

B) Kinanen US patent **6,433,550 B1** issued August 13^h 2002, filed February 13th 2001; which teaches an MRI magnet device with Vibration Compensation for all the MRI components.

C) Jeker et al., US patent 5,744,959 which shows an NMR measurement apparatus with a pulse tube cooler.

D) Havens et al., US patent application publication 2004/0051530 A1 which is the publication of applicant's originally filed instant application, which is noted for the purposes of a complete record. This reference is not available as prior art.

E) Kinanen US patent **6,433,550 B1** issued August 13^h 2002, filed February 13th 2001, which simulates RF pulses not motions of one or more MRI system components.

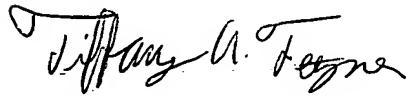
F) Yamashita US patent **6,556,012 B2** filed January 19th 2001.

G) Edelstein et al., article "Making MRI Quieter" Magnetic Resonance Imaging Volume 20 February 2002 pages 155-163. The examiner notes that the applicant is a co-author of this reference, however in this reference the motion of the MRI components tested are actual motions of MRI components not "simulated motions" of MRI components as claimed by applicant.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

13. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.



TAF
July, 7th 2004



Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800